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Yusaku Fujii

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EXAMINER

AKHAVANNIK, HUSSEIN

ART UNIT

PAPER NUMBER

2621

DATE MAILED: 06/08/2004

3

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/803,155

Applicant(s)

FUJII, YUSAKU

Examiner

Hussein Akhavannik

Art Unit

2621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 4 recites the limitation " the evaluation value or values " in line 5. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-4 and 20-24 are rejected under 35 U.S.C. 102(e) as being anticipated by Russo (U.S. Patent No. 6,546,122).

Referring to claim 1, which is representative of claim 23,

- i. Extracting minutiae from each of a plurality of fingerprint images to produce fingerprint data including information regarding the minutiae for each of the fingerprint images is explained by Russo in column 4, lines 45-52 and illustrated by the template T1

(28) and template T2 (32) illustrated in figure 2. Russo illustrate that each template includes information about each of the extracted minutiae, including minutiae location and angle, in figures 7A and 7B.

ii. Investigating a correspondence of the minutiae between the plurality of fingerprint data to search for the same minutiae included commonly in two or more of the plurality of fingerprint data as common minutiae is explained by Russo in column 4, lines 52-59 and illustrated as the common minutiae in figures 10A to 11D.

iii. Selecting one of the common minutiae as a minutia representative of the common minutiae to synthesize the plurality of fingerprint data to produce one synthetic fingerprint data is explained by Russo in column 10, lines 43-67. Russo explain that in the simplest case, one common minutia (matching pair) is selected in order to register the two fingerprint templates onto the same coordinate system.

iv. Validating the synthetic fingerprint data is explained by Russo in column 5, lines 3-10. The synthetic fingerprint of Russo is determined to be valid if the number of common minutiae (matching minutiae) exceed a threshold, which is determined depending on the accuracy required by the system.

Referring to claim 2,

i. A fingerprint data extraction section for extracting minutiae from each of a plurality of fingerprint images to produce fingerprint data including information regarding the minutiae for each of the fingerprint images is illustrated by Russo in figure 2 by the minutiae extraction sections 26 and 30 template T1 (28) and template T2 (32).

Russo illustrate that each template includes information about each of the extracted minutiae, including minutiae location and angle, in figures 7A and 7B.

- ii. A fingerprint data storage section for storing the plurality of fingerprint data produced by the fingerprint data extraction section is explained by Russo in column 4, lines 57-59, wherein the storage section corresponds to the memory.
- iii. A common minutiae searching section for investigating a correspondence of the minutiae between the plurality of fingerprint data to search for the same minutiae included commonly in two or more of the plurality of fingerprint data as common minutiae is illustrated by Russo in figure 2 by the fingerprint matcher 34. Russo explains that the common minutiae are determined in column 4, lines 52-59 and illustrates the common minutiae in figures 10A to 11D.
- iv. A fingerprint data synthesis section for selecting one of the common minutiae as a minutia representative of the common minutiae to synthesize the plurality of fingerprint data to produce one synthetic fingerprint data is illustrated by Russo in figure 2 by the template combining 38. Russo explain that in the simplest case, one common minutia (matching pair) is selected in order to register the two fingerprint templates onto the same coordinate system in column 10, lines 43-67.
- v. A validation section for validating the synthetic fingerprint data is illustrated by Russo in figure 9 by the overlap region calculation 908. Russo explains in column 5, lines 3-10 that the synthetic fingerprint is determined to be valid if the number of common minutiae (matching minutiae) exceeds a threshold, which is determined depending on the accuracy required by the system.

Referring to claim 3, the validation section confirming at least one of validity of a range of presence of the minutiae in the synthetic fingerprint data, validity of one-sidedness of presence of the minutiae in the synthetic fingerprint data, validity of relational information between the minutiae in the synthetic fingerprint data, and validity of the number of the minutiae in the synthetic fingerprint data to validate the synthetic fingerprint data is explained by Russo in column 5, lines 3-10. Russo determines the validity of the synthetic fingerprint image by comparing the number of common minutiae in the synthetic fingerprint image (corresponding to the number of minutiae in the synthetic fingerprint data) to a variable threshold.

Referring to claim 4, the validation section numerically evaluating and confirming any of the criteria of validity determining the validity of the synthetic fingerprint data based on the evaluation value or values of the validity is explained by Russo in column 5, lines 3-10. The number of common minutiae is a numerical evaluation of the validity of the synthetic fingerprint image and the number of common minutiae is confirmed by comparison to a variable threshold.

Referring to claim 20, the fingerprint data synthesis section performing positioning of the minutiae from which the synthetic fingerprint data are produced with reference to a minutiae included commonly in the plurality of fingerprint data is explained by Russo in column 10, lines 43-67, wherein the minutiae are positioned (registered) with reference to a common minutia (one matching pair).

Referring to claim 21, the fingerprint data synthesis section performing positioning of the minutiae from which the synthetic fingerprint data are produced with reference to the center of a fingerprint determined from each of the fingerprint images is illustrated by Russo in figure 4C and explained in column 6, lines 48-57, wherein the minutiae are positioned (registered) with

reference to a common minutia (one matching pair), which is determined with reference to the center of a fingerprint image.

Referring to claim 22, the fingerprint data synthesis section performing positioning of the minutiae from which the synthetic fingerprint data are produced with reference to a minutiae selected from among the minutiae included in the synthetic fingerprint data being produced is explained by Russo in column 10, lines 43-67, wherein the minutiae are positioned (registered) with reference to a common minutia (one matching pair), which is included in the synthetic fingerprint being produced.

Referring to claim 24,

- i. Extracting feature elements from each of a plurality of sets of raw biometric data obtained from the same organism to produce biometric information including information regarding the feature elements for each of the sets of raw biometric data corresponds to claim 1i, wherein the feature elements are minutiae, the raw biometric data are fingerprint images, the organism is a human being, and the biometric information is information about the minutiae.
- ii. Investigating a correspondence of the feature elements between the plurality of biometric information to search for the same feature elements included commonly in two or more of the sets of biometric information as common feature elements corresponds to claim 1ii, wherein the feature elements are minutiae and the biometric information is information about the minutiae.
- iii. Selecting one of the common feature elements as a feature element representative of the common feature elements to synthesize the plurality of biometric information to

produce one synthesized biometric information data corresponds to claim 1iii, wherein the feature elements are minutiae, the biometric information is information about the minutiae, and the synthesized biometric information is the synthesized fingerprint image.

iv. Validating the synthesized biometric information corresponds to claim 1iv, wherein the synthesized biometric information is the synthesized fingerprint image.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 5-13 and 15-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Russo in view of Bolle et al (U.S. Patent No. 6,072,895).

Referring to claim 5, a minutia reliability calculation section for calculating a reliability value of each of the minutiae of the plurality of fingerprint data, and wherein the fingerprint data synthesis section selects the minutia representative of the common minutiae based on the reliability values calculated by the minutia reliability section is not explicitly explained by Russo. However, Bolle et al explain determining reliability of a minutia using four criteria in column 11, lines 14-27. The minutia reliability values for each minutia are individually explained by Bolle et al in column 11, line 28 to column 14, line 37. Bolle et al also explain in column 10, line 61 to column 11, line 4 that a minutia is deleted from further processing if it does not meet all of the reliability criteria. Thus, the unreliable minutiae will not be forwarded for further processing, such as the common minutiae searching of Russo. Russo explains that a

match (common minutia) is determined from extracted minutiae in column 9, lines 5-11 and that, in the simplest case, if one matching pair exists, it is selected as the representative minutia (corresponding to claim 2iv) in column 10, lines 43-67. Thus, by deleting the unreliable minutiae in the system of Russo and Bolle et al, the minutia representative of the common minutiae will not be an unreliable minutia. Bolle et al explain in column 3, lines 17-19 that reducing the number of unreliable features increases the accuracy and reliability of a fingerprint image processing system. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to calculate a reliability value of each of the minutia in the plurality of fingerprint data and select the minutia representative of the common minutiae based on the reliability values calculated as suggested by Bolle et al in the system of Russo because the accuracy and reliability of the fingerprint image processing system will be improved.

Referring to claim 6, the minutia reliability calculation section calculating the reliability value of each of the minutiae based on a difference between an orientation of the minutia and an orientation of a ridge is not explicitly explained by Russo. However, Bolle et al illustrate determining the difference between an orientation of the minutia and an orientation of a ridge in figure 8D. Bolle et al explain in column 3, lines 17-19 that reducing the number of unreliable features increases the accuracy and reliability of a fingerprint image processing system. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine the difference between an orientation of the minutia and an orientation of a ridge as suggested by Bolle et al in the system of Russo because the accuracy and reliability of the fingerprint image processing system will be improved.

Referring to claim 7, the minutia reliability calculation section calculating the reliability value of each of the minutiae based on a length of a ridge or a distance from the minutia to a neighboring minutia is explained by Russo in column 9, lines 42-50, wherein Russo calculates between two neighboring minutiae. Bolle et al also explain determining the distance between two minutiae in column 12, lines 22-26.

Referring to claim 8, the minutia reliability calculation section calculating the reliability value of each of the minutiae based on a distance from the minutia to a neighboring ridge is not explicitly explained by Russo. However, Bolle et al explain determining the distance from a minutia to a ridge in column 13, lines 36-40. Bolle et al explain in column 3, lines 17-19 that reducing the number of unreliable features increases the accuracy and reliability of a fingerprint image processing system. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine the distance from a minutia to a neighboring ridge as suggested by Bolle et al in the system of Russo because the accuracy and reliability of the fingerprint image processing system will be improved.

Referring to claim 9, the minutia reliability calculation section calculating the reliability value of each of the minutiae based on a positional relationship of the minutia to a neighboring minutia is explained by Russo in column 9, lines 42-50, wherein Russo calculates between two neighboring minutiae. The distance between two minutiae is inherently based of the positional relationship between two minutiae.

Referring to claim 10, a verification section for verifying the plurality of fingerprint data and the minutiae reliability calculation section calculating, for each of the minutiae in the plurality of fingerprint data, a verification coincidence possibility of the minutia as the reliability

value based on a result of the verification by the verification section is explained by Russo in column 5, line 58 to column 6, line 6. Russo explains determining verification coincidence values such as the distance between a minutia and one of its neighboring minutiae and the related angle between the minutiae. The coincidence values are used to construct and verify neighborhoods in the plurality of fingerprint data.

Referring to claim 11, the minutia reliability calculation section calculating the verification coincidence evaluation value based on at least one of the results of verification of two minutiae of an object of verification with regard to a position, a type, and an orientation by the verification section is explained by Russo in column 5, line 58 to column 6, line 6. Russo explains using the position of two minutiae to determine the distance between them and use the orientation of two minutiae to determine the angle between them.

Referring to claim 12, the minutia reliability calculation section calculating the verification coincidence evaluation value based on at least one of the results of verification of two minutiae of an object of verification with regard to relational information between each of the verification object minutiae and another minutia by the verification section is explained by Russo in column 5, line 58 to column 6, line 6. Russo explains determining the relational information of distance and angle between two minutiae.

Referring to claim 13, the relational information is at least one of a position, a type, and an orientation of the other minutia is explained by Russo in column 5, line 58 to column 6, line 6. Russo explains using the distance and angle between two minutiae.

Referring to claim 15, the relational information being a connection pattern from each of the minutiae of the verification object to the other minutia along a ridge is explained by Russo in

column 5, line 58 to column 6, line 6. Russo explains determining the relational information of distance and angle between two minutiae, which within a neighborhood, can be along the same ridge.

Referring to claim 16, the minutia reliability calculation section calculating the number of times of verification coincidence of each of the minutiae as the verification coincidence evaluation value is explained by Russo in column 5, lines 3-10. Russo explain counting the number of minutiae that are verified between two fingerprint images, corresponding to a count of two verification coincidence.

Referring to claim 17, the minutia reliability calculation section modifying the reliability value of each of the minutiae based on the reliability value or values of a neighboring minutia or minutiae is not explicitly explained by Russo. However, Bolle et al explain that the reliability calculation is based on density (or distribution-based) pruning in column 14, lines 20-25. Bolle et al explain in column 3, lines 17-19 that reducing the number of unreliable features increases the accuracy and reliability of a fingerprint image processing system. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the reliability value of each of the minutiae based on the reliability value or values of a neighboring minutia or minutiae as suggested by Bolle et al in the system of Russo because the accuracy and reliability of the fingerprint image processing system will be improved.

Referring to claim 18, the verification section also functioning as the common minutia searching section is illustrated by Russo in figure 2 by the fingerprint matcher 34. The fingerprint matcher inputs the reliability information calculated by Russo (as explained in

column 5, line 58 to column 6, line 6) in order to determine common minutiae between the two fingerprint images 22 and 24.

Referring to claim 19, the fingerprint data synthesis section referring to a result of the verification of relational information between each of the minutiae and another minutia by the verification section and collecting that relational information which has high reliability to produce synthesized relational information and using the synthesized relational information as the relational information of the minutiae from which the synthetic fingerprint data is formed is illustrated by Russo in figure 2 by the fingerprint matcher 34, matched minutiae pair 36, and template combiner 38. The template combiner 38 synthesizes the two fingerprint images by using relational information explained in column 5, line 25 to column 6, line 6.

7. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Russo in view of Bolle et al, and further in view of Omori et al (U.S. Patent No. 5,524,161).

Referring to claim 14, the relational information being the number of ridges from each of the minutiae of the verification object to the other minutia is not explicitly explained by Russo or Bolle et al. Though Russo explains determining the distance between a minutia of a verification object to the other minutia in column 5, line 58 to column 6, line 6, Russo does not explain that the distance is measured as a unit of the number of ridges. However, Omori et al explain determining the displacement between two minutiae as a function of the number of ridges in order to create a minutiae information signal in column 5, lines 16-27. Omori et al determine the ridge number and create minutia list to characterize a fingerprint template as illustrated in figure 8. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine the number of ridges between two minutiae as relational

information as suggested by Omori et al in the system of Russo and Bolle et al because the relational information will be more detailed.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Fujii et al (U.S. Patent No. 6,233,348) – To exhibit registering fingerprint images using information extracted from minutiae such as direction of a ridge (figure 5B) and distance of a ridge (figure 6A).

Wu et al (U.S. Patent No. 6,567,765) – To exhibit verifying fingerprint images and correcting invalid minutiae as explained in column 5, lines 50-59 and illustrated in figure 2.

Mainguet (U.S. Patent No. 6,459,804) – To exhibit reconstructing a complete fingerprint image from a collection of partial fingerprint images as explained in the abstract.

Chang et al (U.S. Patent No. 5,572,597) – To exhibit ranking minutiae reliability of minutiae occurring in more than one fingerprint image as explained in column 15, lines 33-46.

Bolle et al (U.S. Patent 6,597,802) – To exhibit a quality assessment and confidence measure in a system that synthesizes fingerprint images as, explained in the abstract and illustrated in figure 9.

Hribernig et al (U.S. Patent No. 6,668,072) – To exhibit selecting an optimum pair to register a plurality of fingerprint images as illustrated in figure 5.

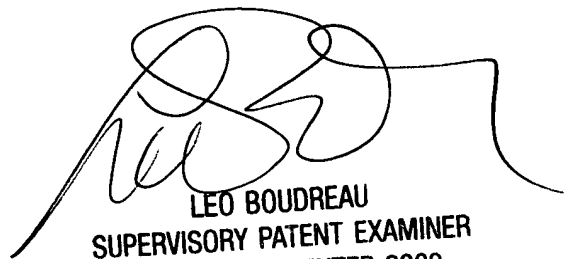
9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hussein Akhavannik whose telephone number is (703)306-4049. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H. Boudreau can be reached on (703)305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hussein Akhavannik
May 28, 2004

HA



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